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P#4
1653

G. Bugenhagen

RAW SEQUENCE LISTING DATE: 04/26/2001
PATENT APPLICATION: US/09/469,200 TIME: 11:07:05

Input Set : A:\3554.011sequence listing ASCII format.txt
Output Set: N:\CRF3\04262001\I469200.raw

ENTERED

```
      3 <110> APPLICANT: Board of Regents of the University of Oklahoma
      5 <120> TITLE OF INVENTION: NUCLEIC ACID ENCODING HYALURONAN SYNTHASE AND METHODS
      6       OF USE
      8 <130> FILE REFERENCE: 617022-7
C--> 10 <140> CURRENT APPLICATION NUMBER: US/09/469,200
C--> 11 <141> CURRENT FILING DATE: 1999-12-21
     13 <150> PRIOR APPLICATION NUMBER: 60/080,414
     14 <151> PRIOR FILING DATE: 1998-04-02
     16 <150> PRIOR APPLICATION NUMBER: 60/178,851
     17 <151> PRIOR FILING DATE: 1998-10-26
     19 <160> NUMBER OF SEQ ID NOS: 29
     21 <170> SOFTWARE: PatentIn Ver. 2.0
     23 <210> SEQ ID NO: 1
     24 <211> LENGTH: 972
     25 <212> TYPE: PRT
     26 <213> ORGANISM: Pasteurella multocida
     28 <400> SEQUENCE: 1
     29 Met Asn Thr Leu Ser Gln Ala Ile Lys Ala Tyr Asn Ser Asn Asp Tyr
     30   1               5                  10                  15
     32 Gln Leu Ala Leu Lys Leu Phe Glu Lys Ser Ala Glu Ile Tyr Gly Arg
     33              20                  25                  30
     35 Lys Ile Val Glu Phe Gln Ile Thr Lys Cys Gln Glu Lys Leu Ser Ala
     36          35                  40                  45
     38 His Pro Ser Val Asn Ser Ala His Leu Ser Val Asn Lys Glu Glu Lys
     39      50                  55                  60
     41 Val Asn Val Cys Asp Ser Pro Leu Asp Ile Ala Thr Gln Leu Leu Leu
     42  65                  70                  75                  80
     44 Ser Asn Val Lys Lys Leu Val Leu Ser Asp Ser Glu Lys Asn Thr Leu
     45                  85                  90                  95
     47 Lys Asn Lys Trp Lys Leu Leu Thr Glu Lys Lys Ser Glu Asn Ala Glu
     48             100                 105                 110
     50 Val Arg Ala Val Ala Leu Val Pro Lys Asp Phe Pro Lys Asp Leu Val
     51         115                 120                 125
     53 Leu Ala Pro Leu Pro Asp His Val Asn Asp Phe Thr Trp Tyr Lys Lys
     54     130                 135                 140
     56 Arg Lys Lys Arg Leu Gly Ile Lys Pro Glu His Gln His Val Gly Leu
     57 145                 150                 155                 160
     59 Ser Ile Ile Val Thr Thr Phe Asn Arg Pro Ala Ile Leu Ser Ile Thr
     60                 165                 170                 175
     62 Leu Ala Cys Leu Val Asn Gln Lys Thr His Tyr Pro Phe Glu Val Ile
     63             180                 185                 190
     65 Val Thr Asp Asp Gly Ser Gln Glu Asp Leu Ser Pro Ile Ile Arg Gln
     66         195                 200                 205
     68 Tyr Glu Asn Lys Leu Asp Ile Arg Tyr Val Arg Gln Lys Asp Asn Gly
     69     210                 215                 220
     71 Phe Gln Ala Ser Ala Ala Arg Asn Met Gly Leu Arg Leu Ala Lys Tyr
     72 225                 230                 235                 240
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74 Asp Phe Ile Gly Leu Leu Asp Cys Asp Met Ala Pro Asn Pro Leu Trp
75                 245                 250                 255
77 Val His Ser Tyr Val Ala Glu Leu Leu Glu Asp Asp Asp Leu Thr Ile
78             260                 265                 270
80 Ile Gly Pro Arg Lys Tyr Ile Asp Thr Gln His Ile Asp Pro Lys Asp
81         275                 280                 285
83 Phe Leu Asn Asn Ala Ser Leu Leu Glu Ser Leu Pro Glu Val Lys Thr
84     290                 295                 300
86 Asn Asn Ser Val Ala Ala Lys Gly Glu Gly Thr Val Ser Leu Asp Trp
87 305                 310                 315                 320
89 Arg Leu Glu Gln Phe Glu Lys Thr Glu Asn Leu Arg Leu Ser Asp Ser
90                 325                 330                 335
92 Pro Phe Arg Phe Phe Ala Ala Gly Asn Val Ala Phe Ala Lys Lys Trp
93             340                 345                 350
95 Leu Asn Lys Ser Gly Phe Phe Asp Glu Glu Phe Asn His Trp Gly Gly
96         355                 360                 365
98 Glu Asp Val Glu Phe Gly Tyr Arg Leu Phe Arg Tyr Gly Ser Phe Phe
99     370                 375                 380
101 Lys Thr Ile Asp Gly Ile Met Ala Tyr His Gln Glu Pro Pro Gly Lys
102 385                 390                 395                 400
104 Glu Asn Glu Thr Asp Arg Glu Ala Gly Lys Asn Ile Thr Leu Asp Ile
105                 405                 410                 415
107 Met Arg Glu Lys Val Pro Tyr Ile Tyr Arg Lys Leu Leu Pro Ile Glu
108             420                 425                 430
110 Asp Ser His Ile Asn Arg Val Pro Leu Val Ser Ile Tyr Ile Pro Ala
111         435                 440                 445
113 Tyr Asn Cys Ala Asn Tyr Ile Gln Arg Cys Val Asp Ser Ala Leu Asn
114     450                 455                 460
116 Gln Thr Val Val Asp Leu Glu Val Cys Ile Cys Asn Asp Gly Ser Thr
117 465                 470                 475                 480
119 Asp Asn Thr Leu Glu Val Ile Asn Lys Leu Tyr Gly Asn Asn Pro Arg
120                 485                 490                 495
122 Val Arg Ile Met Ser Lys Pro Asn Gly Gly Ile Ala Ser Ala Ser Asn
123             500                 505                 510
125 Ala Ala Val Ser Phe Ala Lys Gly Tyr Tyr Ile Gly Gln Leu Asp Ser
126         515                 520                 525
128 Asp Asp Tyr Leu Glu Pro Asp Ala Val Glu Leu Cys Leu Lys Glu Phe
129     530                 535                 540
131 Leu Lys Asp Lys Thr Leu Ala Cys Val Tyr Thr Thr Asn Arg Asn Val
132 545                 550                 555                 560
134 Asn Pro Asp Gly Ser Leu Ile Ala Asn Gly Tyr Asn Trp Pro Glu Phe
135                 565                 570                 575
137 Ser Arg Glu Lys Leu Thr Thr Ala Met Ile Ala His His Phe Arg Met
138             580                 585                 590
140 Phe Thr Ile Arg Ala Trp His Leu Thr Asp Gly Phe Asn Glu Lys Ile
141         595                 600                 605
143 Glu Asn Ala Val Asp Tyr Asp Met Phe Leu Lys Leu Ser Glu Val Gly
144     610                 615                 620
146 Lys Phe Lys His Leu Asn Lys Ile Cys Tyr Asn Arg Val Leu His Gly
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RAW SEQUENCE LISTING DATE: 04/26/2001
PATENT APPLICATION: US/09/469,200 TIME: 11:07:05

Input Set : A:\3554.011sequence listing ASCII format.txt
Output Set: N:\CRF3\04262001\I469200.raw

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147 625                 630                 635                 640
149 Asp Asn Thr Ser Ile Lys Lys Leu Gly Ile Gln Lys Lys Asn His Phe
150                 645                 650                 655
152 Val Val Val Asn Gln Ser Leu Asn Arg Gln Gly Ile Thr Tyr Tyr Asn
153             660                 665                 670
155 Tyr Asp Glu Phe Asp Asp Leu Asp Glu Ser Arg Lys Tyr Ile Phe Asn
156         675                 680                 685
158 Lys Thr Ala Glu Tyr Gln Glu Glu Ile Asp Ile Leu Lys Asp Ile Lys
159     690                 695                 700
161 Ile Ile Gln Asn Lys Asp Ala Lys Ile Ala Val Ser Ile Phe Tyr Pro
162 705                 710                 715                 720
164 Asn Thr Leu Asn Gly Leu Val Lys Lys Leu Asn Asn Ile Ile Glu Tyr
165                 725                 730                 735
167 Asn Lys Asn Ile Phe Val Ile Val Leu His Val Asp Lys Asn His Leu
168             740                 745                 750
170 Thr Pro Asp Ile Lys Lys Glu Ile Leu Ala Phe Tyr His Lys His Gln
171         755                 760                 765
173 Val Asn Ile Leu Leu Asn Asn Asp Ile Ser Tyr Tyr Thr Ser Asn Arg
174     770                 775                 780
176 Leu Ile Lys Thr Glu Ala His Leu Ser Asn Ile Asn Lys Leu Ser Gln
177 785                 790                 795                 800
179 Leu Asn Leu Asn Cys Glu Tyr Ile Ile Phe Asp Asn His Asp Ser Leu
180                 805                 810                 815
182 Phe Val Lys Asn Asp Ser Tyr Ala Tyr Met Lys Lys Tyr Asp Val Gly
183             820                 825                 830
185 Met Asn Phe Ser Ala Leu Thr His Asp Trp Ile Glu Lys Ile Asn Ala
186         835                 840                 845
188 His Pro Pro Phe Lys Lys Leu Ile Lys Thr Tyr Phe Asn Asp Asn Asp
189     850                 855                 860
191 Leu Lys Ser Met Asn Val Lys Gly Ala Ser Gln Gly Met Phe Met Thr
192 865                 870                 875                 880
194 Tyr Ala Leu Ala His Glu Leu Leu Thr Ile Ile Lys Glu Val Ile Thr
195                 885                 890                 895
197 Ser Cys Gln Ser Ile Asp Ser Val Pro Glu Tyr Asn Thr Glu Asp Ile
198             900                 905                 910
200 Trp Phe Gln Phe Ala Leu Leu Ile Leu Glu Lys Lys Thr Gly His Val
201         915                 920                 925
203 Phe Asn Lys Thr Ser Thr Leu Thr Tyr Met Pro Trp Glu Arg Lys Leu
204     930                 935                 940
206 Gln Trp Thr Asn Glu Gln Ile Glu Ser Ala Lys Arg Gly Glu Asn Ile
207 945                 950                 955                 960
209 Pro Val Asn Lys Phe Ile Ile Asn Ser Ile Thr Leu
210                 965                 970
213 <210> SEQ ID NO: 2
214 <211> LENGTH: 2937
215 <212> TYPE: DNA
216 <213> ORGANISM: Pasteurella multocida
218 <400> SEQUENCE: 2
219 atttttaag gacagaaaat gaatacatta tcacaagcaa taaaagcata taacagcaat 60
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RAW SEQUENCE LISTING DATE: 04/26/2001
PATENT APPLICATION: US/09/469,200 TIME: 11:07:05

Input Set : A:\3554.011sequence listing ASCII format.txt
Output Set: N:\CRF3\04262001\I469200.raw

220 gactatcaat tagcactcaa attatttgaa aagtcggcgg aaatctatgg acggaaaatt 120
221 gttgaatttc aaattaccaa atgccaagaa aaactctcag cacatccttc tgttaattca 180
222 gcacatcttt ctgtaaataa agaagaaaaa gtcaatgttt gcgatagtcc gttagatatt 240
223 gcaacacaac tgttactttc caacgtaaaa aaattagtac tttctgactc ggaaaaaaac 300
224 acgttaaaaa ataaatggaa attgctcact gagaagaaat ctgaaaatgc ggaggtaaga 360
225 gcggtcgccc ttgtaccaaa agattttccc aaagatctgg ttttagcgcc tttacctgat 420
226 catgttaatg attttacatg gtacaaaaag cgaaagaaaa gacttggcat aaaacctgaa 480
227 catcaacatg ttggtctttc tattatcgtt acaacattca atcgaccagc aattttatcg 540
228 attacattag cctgtttagt aaaccaaaaa acacattacc cgtttgaagt tatcgtgaca 600
229 gatgatggta gtcaggaaga tctatcaccg atcattcgcc aatatgaaaa taaattggat 660
230 attcgctacg tcagacaaaa agataacggt tttcaagcca gtgccgctcg gaatatggga 720
231 ttacgcttag caaaatatga ctttattggc ttactcgact gtgatatggc gccaaatcca 780
232 ttatgggttc attcttatgt tgcagagcta ttagaagatg atgatttaac aatcattggt 840
233 ccaagaaaat acatcgatac acaacatatt gacccaaaag acttcttaaa taacgcgagt 900
234 ttgcttgaat cattaccaga agtgaaaacc aataatagtg ttgccgcaaa aggggaagga 960
235 acagtttctc tggattggcg cttagaacaa ttcgaaaaaa cagaaaatct ccgcttatcc 1020
236 gattcgcctt tccgtttttt tgcggcgggt aatgttgctt tcgctaaaaa atggctaaat 1080
237 aaatccggtt tctttgatga ggaatttaat cactggggtg gagaagatgt ggaatttgga 1140
238 tatcgcttat tccgttacgg tagtttcttt aaaactattg atggcattat ggcctaccat 1200
239 caagagccac caggtaaaga aaatgaaacc gatcgtgaag cgggaaaaaa tattacgctc 1260
240 gatattatga gagaaaaggt cccttatatc tatagaaaac ttttaccaat agaagattcg 1320
241 catatcaata gagtaccttt agtttcaatt tatatcccag cttataactg tgcaaactat 1380
242 attcaacgtt gcgtagatag tgcactgaat cagactgttg ttgatctcga ggtttgtatt 1440
243 tgtaacgatg gttcaacaga taatacctta gaagtgatca ataagcttta tggtaataat 1500
244 cctagggtac gcatcatgtc taaaccaaat ggcggaatag cctcagcatc aaatgcagcc 1560
245 gtttcttttg ctaaaggtta ttacattggg cagttagatt cagatgatta tcttgagcct 1620
246 gatgcagttg aactgtgttt aaaagaattt ttaaaagata aaacgctagc ttgtgtttat 1680
247 accactaata gaaacgtcaa tccggatggt agcttaatcg ctaatggtta caattggcca 1740
248 gaattttcac gagaaaaact cacaacggct atgattgctc accactttag aatgttcacg 1800
249 attagagctt ggcatttaac tgatggattc aatgaaaaaa ttgaaaatgc cgtagactat 1860
250 gacatgttcc tcaaactcag tgaagttgga aaatttaaac atcttaataa aatctgctat 1920
251 aaccgtgtat tacatggtga taacacatca attaagaaac ttggcattca aaagaaaaac 1980
252 cattttgttg tagtcaatca gtcattaaat agacaaggca taacttatta taattatgac 2040
253 gaatttgatg atttagatga aagtagaaag tatattttca ataaaaccgc tgaatatcaa 2100
254 gaagagattg atatcttaaa agatattaaa atcatccaga ataaagatgc caaaatcgca 2160
255 gtcagtattt tttatcccaa tacattaaac ggcttagtga aaaaactaaa caatattatt 2220
256 gaatataata aaaatatatt cgttattgtt ctacatgttg ataagaatca tcttacacca 2280
257 gatatcaaaa aagaaatact agccttctat cataaacatc aagtgaatat tttactaaat 2340
258 aatgatatct catattacac gagtaataga ttaataaaaa ctgaggcgca tttaagtaat 2400
259 attaataaat taagtcagtt aaatctaaat tgtgaataca tcatttttga taatcatgac 2460
260 agcctattcg ttaaaaatga cagctatgct tatatgaaaa aatatgatgt cggcatgaat 2520
261 ttctcagcat taacacatga ttggatcgag aaaatcaatg cgcatccacc atttaaaaag 2580
262 ctcattaaaa cttattttaa tgacaatgac ttaaaaagta tgaatgtgaa aggggcatca 2640
263 caaggtatgt ttatgacgta tgcgctagcg catgagcttc tgacgattat taaagaagtc 2700
264 atcacatctt gccagtcaat tgatagtgtg ccagaatata acactgagga tatttggttc 2760
265 caatttgcac ttttaatctt agaaaagaaa accggccatg tatttaataa aacatcgacc 2820
266 ctgacttata tgccttggga acgaaaatta caatggacaa atgaacaaat tgaaagtgca 2880
267 aaaagaggag aaaatatacc tgttaacaag ttcattatta atagtataac tctataa 2937
269 <210> SEQ ID NO: 3

RAW SEQUENCE LISTING DATE: 04/26/2001
PATENT APPLICATION: US/09/469,200 TIME: 11:07:05

Input Set : A:\3554.011sequence listing ASCII format.txt
Output Set: N:\CRF3\04262001\I469200.raw

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270 <211> LENGTH: 972
271 <212> TYPE: PRT
272 <213> ORGANISM: Pasteurella multocida
274 <400> SEQUENCE: 3
275 Met Asn Thr Leu Ser Gln Ala Ile Lys Ala Tyr Asn Cys Asn Asp Tyr
276   1               5                  10                  15
278 Glu Leu Ala Leu Lys Leu Phe Glu Lys Ser Ala Glu Thr Tyr Gly Arg
279              20                  25                  30
281 Lys Ile Val Glu Phe Gln Ile Ile Lys Cys Lys Glu Lys Leu Ser Thr
282          35                  40                  45
284 Asn Ser Tyr Val Ser Glu Asp Asn Ser Tyr Val Ser Glu Asp Lys Lys
285      50                  55                  60
287 Asn Ser Val Cys Asp Ser Ser Leu Asp Ile Ala Thr Gln Leu Leu Ile
288  65                  70                  75                  80
290 Ser Asn Val Lys Lys Leu Thr Leu Ser Glu Ser Glu Lys Asn Ser Leu
291                  85                  90                  95
293 Lys Asn Lys Trp Lys Ser Ile Thr Gly Lys Lys Ser Glu Asn Ala Glu
294             100                 105                 110
296 Ile Arg Lys Val Glu Leu Val Pro Lys Asp Phe Pro Lys Asp Leu Val
297         115                 120                 125
299 Leu Ala Pro Leu Pro Asp His Val Asn Asp Phe Thr Trp Tyr Lys Asn
300     130                 135                 140
302 Arg Lys Lys Arg Leu Gly Ile Lys Pro Val Asn Lys Asn Ile Gly Leu
303 145                 150                 155                 160
305 Ser Ile Ile Ile Pro Thr Phe Asn Arg Ser Arg Ile Leu Asp Ile Thr
306                 165                 170                 175
308 Leu Ala Cys Leu Val Asn Gln Lys Thr Asn Tyr Pro Phe Glu Val Val
309             180                 185                 190
311 Val Ala Asp Asp Gly Ser Lys Glu Asn Leu Leu Thr Ile Val Gln Lys
312         195                 200                 205
314 Tyr Glu Gln Lys Leu Asp Ile Lys Tyr Val Arg Gln Lys Asp Tyr Gly
315     210                 215                 220
317 Tyr Gln Leu Cys Ala Val Arg Asn Leu Gly Leu Arg Thr Ala Lys Tyr
318 225                 230                 235                 240
320 Asp Phe Val Ser Ile Leu Asp Cys Asp Met Ala Pro Gln Gln Leu Trp
321                 245                 250                 255
323 Val His Ser Tyr Leu Thr Glu Leu Leu Glu Asp Ile Asp Ile Val Leu
324             260                 265                 270
326 Ile Gly Pro Arg Lys Tyr Val Asp Thr His Asn Ile Thr Ala Glu Gln
327         275                 280                 285
329 Phe Leu Asn Asp Pro Tyr Leu Ile Glu Ser Leu Pro Glu Thr Ala Thr
330     290                 295                 300
332 Asn Asn Asn Pro Ser Ile Thr Ser Lys Gly Asn Ile Ser Leu Asp Trp
333 305                 310                 315                 320
335 Arg Leu Glu His Phe Lys Lys Thr Asp Asn Leu Arg Leu Cys Asp Ser
336                 325                 330                 335
338 Pro Phe Arg Tyr Phe Val Ala Gly Asn Val Ala Phe Ser Lys Glu Trp
339             340                 345                 350
341 Leu Asn Lys Val Gly Trp Phe Asp Glu Glu Phe Asn His Trp Gly Gly
```

FYI

Please Note:

Us of n and/ r Xaa have been detected in the Sequence Listing. Please review the Sequence Listing to ensure that a c rresponding xplanati n is presented in the <220> to <223> fields of each sequence which presents at least one n or Xaa.

VERIFICATION SUMMARY DATE: 04/26/2001
PATENT APPLICATION: **US/09/469,200** TIME: 11:07:06

Input Set : **A:\3554.011sequence listing ASCII format.txt**
Output Set: **N:\CRF3\04262001\I469200.raw**

L:10 M:270 C: Current Application Number differs, Replaced Current Application Number
L:11 M:271 C: Current Filing Date differs, Replaced Current Filing Date
L:1019 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1025 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1031 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1037 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1043 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1046 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1049 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1052 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1055 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1058 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1061 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1067 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1070 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1073 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1076 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1079 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1091 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1097 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1154 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1193 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:9
L:1384 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:15
L:1387 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:15
L:1390 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:15
L:1465 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:18
L:1468 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:18
L:1486 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:19
L:1514 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:20
L:1532 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:21
L:1565 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:22
L:1651 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:29